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Environmental policy development and decision-making: A scenarios and systems mapping approach to large-scale systems re-design

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Environmental Policy Development and Decision-Making

A Scenarios and Systems Mapping Approach to Large-Scale Systems Re-Design

"With the earth and its ecological systems pushed close to planetary boundaries, we need innovative solutions that take into account the complexity of the problems and then foster solutions that permit our systems to learn, adapt, and occasionally transform without collapsing. More important, we need to build the capacity to find such solutions over and over *again."*

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Abstract
Taking Stock was a year-long project undertaken by Alberta Eco-Trust to understand and address long- standing issues with respect to the way Albertans create and use environmental policy to make decisions concerning land, air, water and bio-diversity in the Province. This paper describes and critiques the methodology used in the project: Scenario Development, Systems Mapping and a form of Systems Design. These three approaches, used in combination, represent a substantive interdisciplinary approach to a complex multi-stakeholder problem area. General findings conclude that e*ngaging 'seasoned policy practitioners' with widely different perspectives* in all work phases has promising potential but comes with a numb*er of additional 'care points'.* The aspirational form of the scenarios proved to be a useful format for participant understanding but required *'expertise' in* creating the necessary narratives and articulation of the challenges. The systems mapping format brought to life the complexity and structure of the current dynamics but required sufficient learning time *to 'read the maps'*. The representational form of the systems maps proved to be a useful (but restricted) format for the design phase with the systems requirements generated by the scenarios work pr*oviding the 'design criteria'.*

Introduction

For some years there has been a growing recognition that the complexity of environmental issues was making the development of policy difficult and problematic in Alberta. There is dissatisfaction among environmentalists, industry and government with a policy development and decision-making process that is opaque, unpredictable and lacking any consistent direction or principles. In this context, Alberta Ecotrust initiated and funded a project, entitled **Taking Stock**, to understand and identify design improvements in the environmental decision-making and policy development system in Alberta. The project extended over a year involving more than 60 participants from academia, environmental NGO's, business and government.

The specific objectives of the project were:

- Describe the current environmental policy and decision-making system (EPD&DM);
- Identify current and future challenges facing the system;
- Develop design criteria to enhance the system's ability to meet future challenges;
- Design system changes that could improve the system;
- Build capacity for trust and collaboration; and
- Explore and evaluate the combined methodology of scenarios and systems

mapping.

The logic of the project was based on two key perspectives:

1) That better decision-making processes lead to better policy decisions and ultimately better environmental outcomes; and
2) That better decision-making and policy development requires anticipation of future challenges, translated into systems requirements as a basis for redesigning the current system.

Note that the first perspective focuses the work on the system rather than the outcomes of the system. The second perspective focuses the work on redesigning the existing system, a practical rather than idealistic perspective and emphasizes the need for any redesign of the system to include future challenges.

The purpose of this paper is to summarize some of the results of the Taking Stock project but more specifically to critique the methodologies applied in the project. What worked? What didn't? What were the problems and challenges in conducting the research?

Elements of Design Method

The Taking Stock project involved five steps as shown in Figure 1. The steps encompass three major elements. One is the development of scenarios as a basis for generating future challenges. Second is the application of systems mapping to articulate and visualize the current system. And third is the integration of the results of the scenarios and systems mapping to identify changes that would redesign and improve the effectiveness of the environmental decision-making and policy development system.

Steps 1 and 2 utilize established scenario development methods to generate a range of alternative descriptions of the future as a basis for identifying a set of future challenges facing the environmental decision-making and policy development system. As well as providing different future paths and outcomes for the system at a high level of abstraction, the scenario development process provided a context for describing the system without detailed definitions of the system. From previous work it was recognized that it is often difficult to define a system and its boundaries a priori. Engaged participants who understand the system in a more open approach are needed to uncover how the system is being described "naturally" in free dialogue. The scenarios open that dialogue. This is why the scenarios focusing on the future were developed prior to the systems mapping of the current system.

Step 3 involved a new methodology designed to provide a cognitive description of the current system. From the experience of the scenarios and a highly productive focus group session with a small number of individuals knowledgeable about environmental policy development, the system was divided into four subsystems for analysis. These are described more fully below.

Step 4 involved bringing together the results of the scenarios, primarily future challenges, and the descriptions and analysis of the system from the systems mapping work. This involved first identifying within each subsystem aspects of the system which could be redesigned to enhance the system's capacity to meet future challenges. Second, the analysis involved identifying improvements across the subsystems for the system as a whole. Without established methodologies in this area, this work was exploratory and novel. A major challenge at this stage was to maintain participation at a level needed to undertake relatively detailed work that required considerable familiarity with the maps. More will be discussed below.

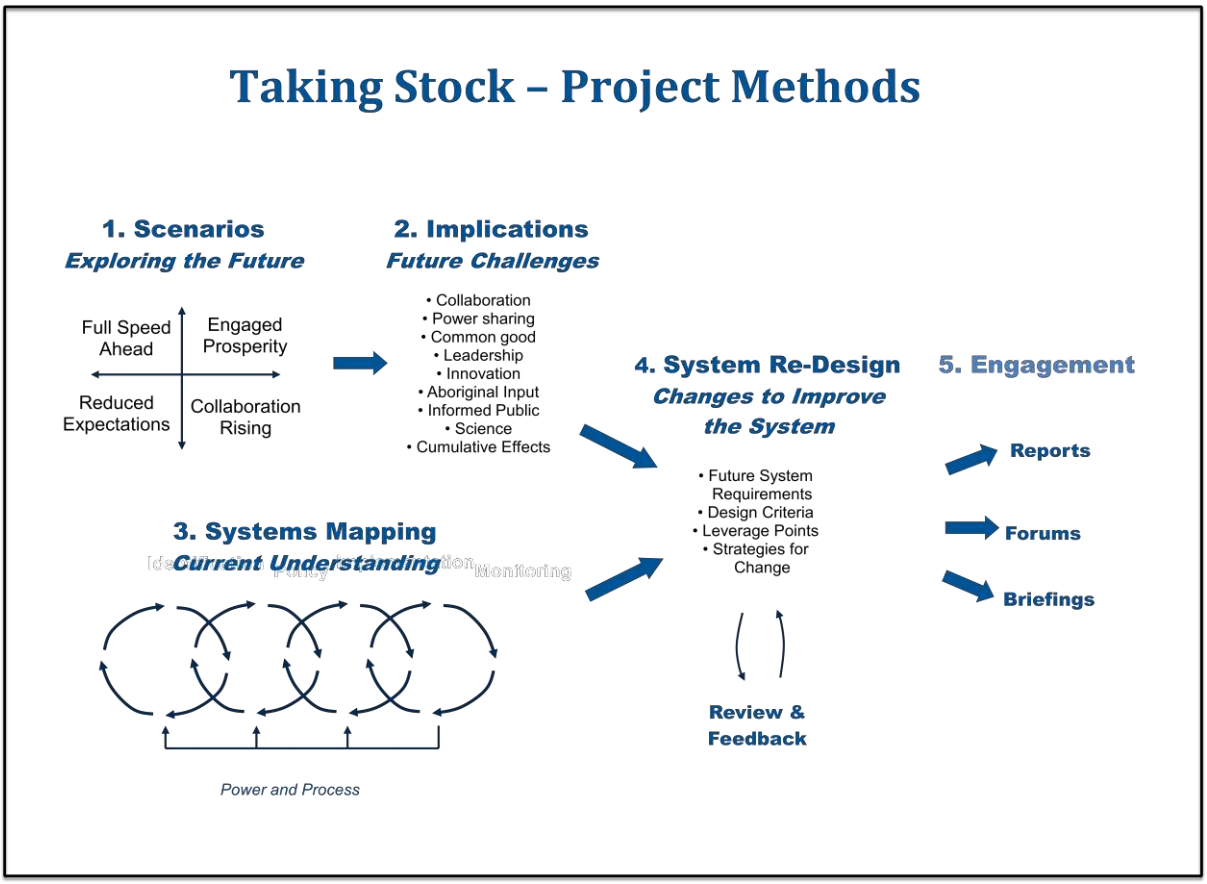

Figure 1. Five Steps of the Project – The Project Methods.

Scenarios

Scenario development is an approach to explore the future in the face of uncertainty. It has become a relatively well developed methodology. In this research, the scenario development process involved five major steps, all involving direct input and participation by a group of 20 plus participants in a 1 ½ day facilitated workshop. The steps include:

1) Clarifying the focus of the scenarios
2) Identifying the major forces driving change in the system
3) Identifying two critical uncertainties
4) Using the critical uncertainties to create a framework for the scenarios; and
5) Describing the future paths and outcomes for each scenario narrative.

The focus of the scenarios was defined by the focus of the work, namely, the environmental decision- making and policy development system. This was relatively novel as most scenario projects focus on an outcome (e.g., environment, industry, country). This focus on a process or system of processes proved effective and valuable. Driving forces surface the major variables affecting the system typically ranging across social, economic, political, environmental and technological factors.

Critical uncertainties are defined as major variables that are both important in shaping the future of the system and are highly uncertain. The purpose of scenarios is not to build stories of the most likely future but to intentionally strive to develop stories that diverge. In this way scenarios capture a wide range of possible futures as a basis of developing and testing different

strategies or decisions. As a result, critical uncertainties articulate irreducible uncertainties (i.e. cannot be resolved with more information) that define a wide range of future outcomes. In this research, two critical uncertainties were defined and used to create a scenario framework as shown in Figure 2.

One critical uncertainty focuses on the economy. Growth could be high with rapid development supporting strong government revenues. Alternatively growth could be low with slow development and depressed government revenues. The other critical uncertainty focused on the form of stakeholder engagement - on its extent and distribution of power. Stakeholder engagement in the system could be polarized, emphasizing private dialogue, or hierarchical and concentrated in few groups. Or, in contrast, the future could involve a collaborative, highly public approach with a network of distributed power.

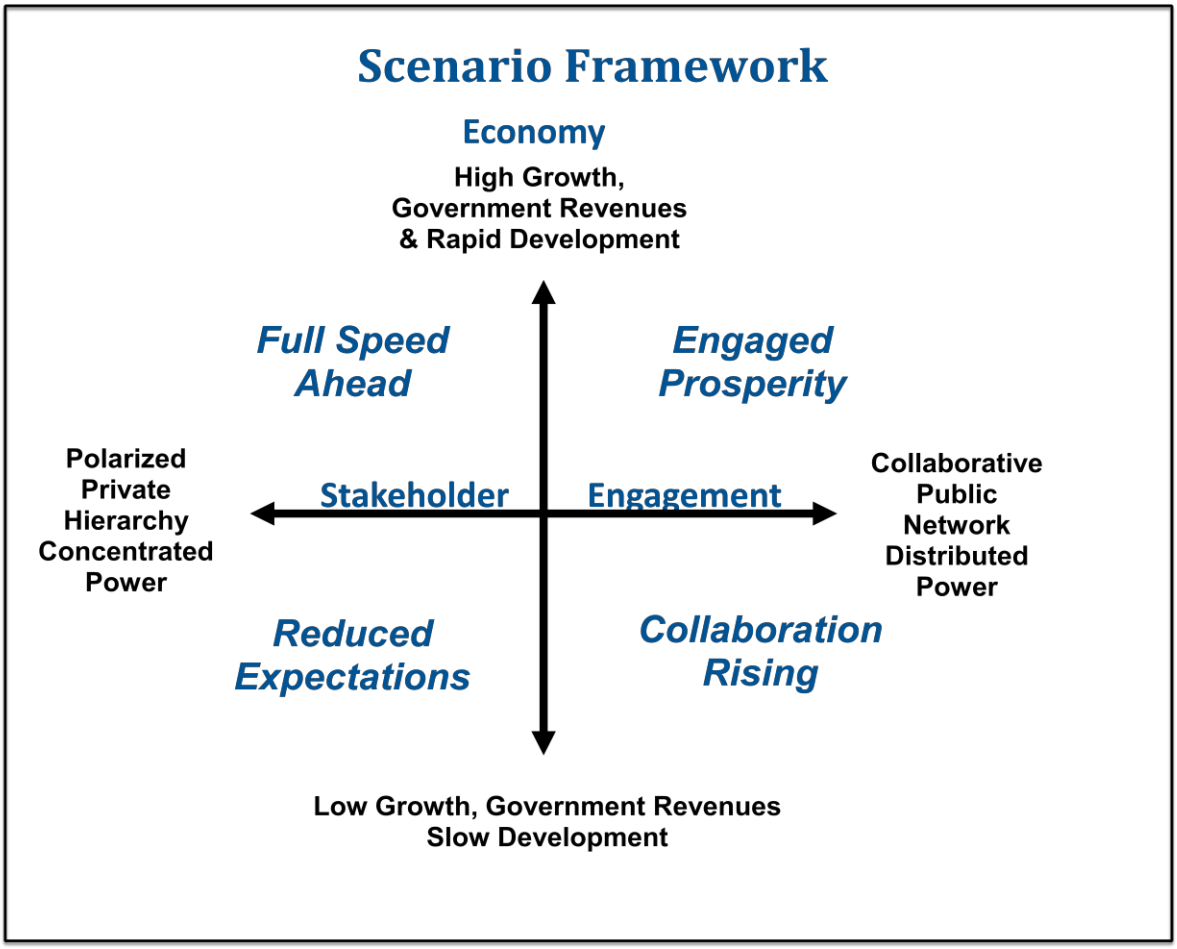

Figure 2. Resulting Scenario Framework.

The framework provides the basis of four distinctly different scenarios as named in Figure 2. The purpose is not to fully describe the scenarios as we are focused on the methodology, so only a summary of characteristics is provided in Figure 3.

The scenarios provide a context for exploring important questions. For example, what are the implications for the environmental decision-making and policy development system in each scenario? Specifically for this project, the focus was on the question: what are the challenges for the system in each scenario. Having identified challenges within each scenario. An overall list of

major challenges was developed.

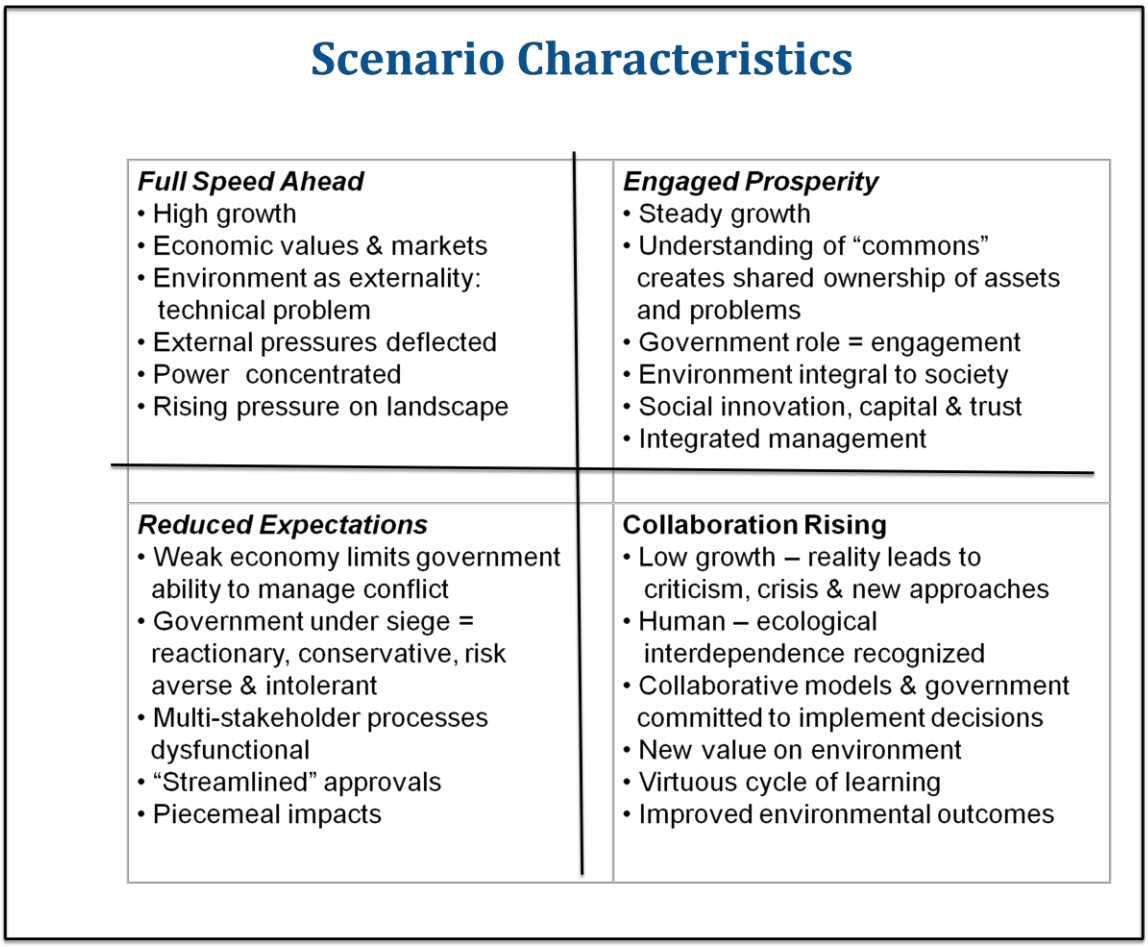

Figure 3. The Scenario Results.

Future challenges include:

- Articulate a vision including goals and expectations of roles for all stakeholders;
- Foster a mindset & motivation to address issues from a systems perspective with collaboration & respect;
- Generational thinking balancing short and long term effects;
- Support collaboration at all levels;
- Support public engagement;
- Explicitly create mechanisms for input from Aboriginal peoples;
- Build flexibility into the system to enhance ability to adapt;
- Implement cumulative effects;
- Build government capacity to enhance collaboration & consultation processes; and
- Clarify the role of government.

Critique of Scenarios

The scenarios were a powerful and valuable approach to opening dialogue on the system and developing major challenges that the environmental decision-making and policy development system must deal with in the future. These translate into systems requirements in redesigning the system in step 4. A major cost of the scenarios is the amount of time and energy required for their

development. A summary of pros and cons is provided below.

The scenario development process demonstrated a number of positive outcomes and impacts:

- Powerful method for engagement; strong participant support for dialogue;
- Valuable in clarifying context: open ended dialogue to broadly define what is the "system"? What is the appropriate vocabulary and "boundaries"?;
- Unique in focusing on future of a "process" or "system" (instead of topic, e.g., environment or industry);
- Valuable in emphasizing complexity, dynamics and emerging characteristics of a system
- Requires and reinforces "systems thinking";

However, there were some costs to gaining the insights from the mapping work:

- Lengthy process consuming considerable participant energy;
- Can be affected by participants not showing up for all sessions affecting quality and commitment (backpedalling); and
- Requires facilitation leadership to manage process while ensuring participant ownership.

Systems Mapping

The scenario work focused on the future. The systems mapping work, in contrast, focused on the present – on identifying how environmental policy development and decision making is currently practiced in Alberta. The Systems Mapping technique used here differs from other methods (Morelli, 2007; Bosschaert, 2014; Vensim, 2012) in that it is predominantly an inductive approach. Systems Mapping is a process for capturing and amalgamating the multiple perspectives and collective knowledge within multi-interest groups. The strength of such groups is the variety of perspectives and the depth of understanding the members bring to the conversation, and a systems map provides insight into the group's thinking about an issue, challenge, problem or situation. Critically, the insight provided by the map exceeds not only that of any individual perspective but that of any summary of all of the individual perspectives. The process draws out deep assumptions and hidden knowledge that are not surfaced in more conventional group conversations.

A systems map is a 'cognitive graphic' of how a group thinks about an issue, challenge, problem or situation.

The group builds the systems map together through a facilitated discussion that provides a common thinking space in which each participant can ask questions and debate points of view, tell his or her story, and see how that story fits with the stories of other participants. The result is a common narrative about the selected issue. The narrative contains all the individual perspectives, linked in a way that not only identifies their individual essence but the interconnectedness of all the perspectives. The value lies less in the maps than in what can be learned from them. The process of building maps elicits a range of knowledge, the maps represent integrated perspectives which can then be collectively interrogated.

For Taking Stock, the EPD&DM system was mapped as four constituent subsystems that are commonly understood to include most of the activities and actors in the overall system:

- Issues Identification: the subsystem that identifies and articulates what needs attention and what must be considered;
- Policy Setting: the subsystem that generates options and decides the policy content and focus;
- Policy Implementation: the subsystem that puts into practice the spirit and substance of the policy; and
- Monitoring: the subsystem that observes and assesses implementation, application of policy, and measures and evaluates performance.

Each set of subsystem maps were developed independently. Mapping each subsystem required: a) identifying the activities that occur in the subsystem and summarizing them into mapping elements; b) linking the elements through direct, meaningful relationships; c) weighting the relationships based on their degree of impact; and d) creating a visual representation – a set of maps.

The Policy Setting subsystem is selected for more illustrative detail in this paper. The first step was to develop the subsystem elements which were processes (i.e. activities that were observable to all group members generating the map). These are displayed in the outer edges of the diagram in Figure 4. To create the elements the group generated all processes (activities) they saw as applicable to the issue. They then did an 'affinity grouping' step to get 8-12 groupings (9 in this case) and named each grouping. Finally, the group ensured that each final grouping is distinct one from the other.

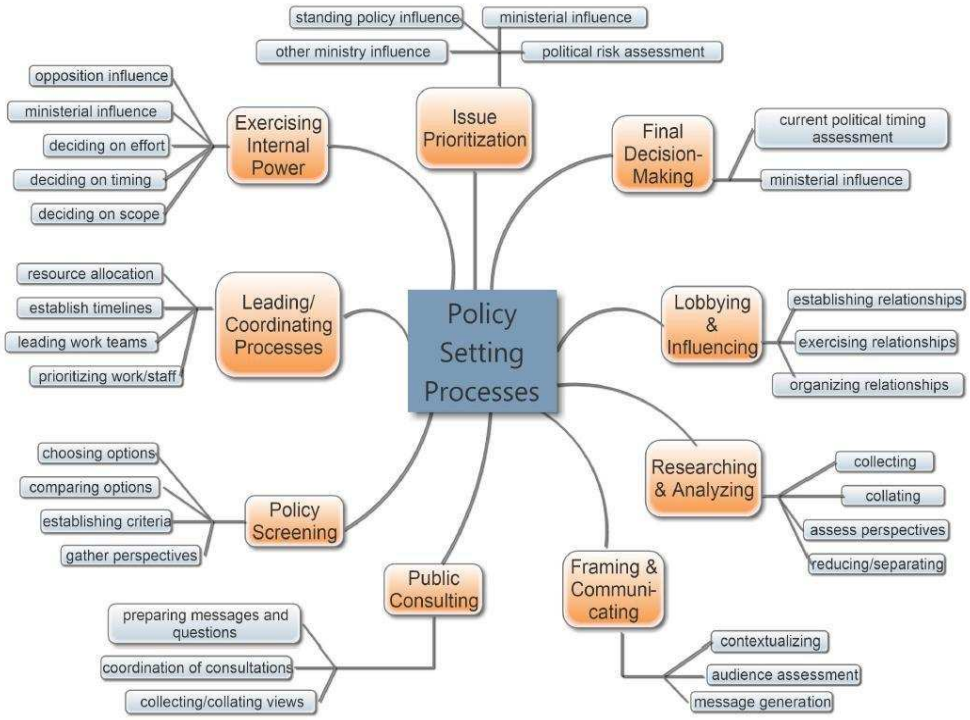

Figure 4. Mind Map of Policy Setting Processes.

To generate the relationships between elements a matrix is set up on a spreadsheet as shown in by an excerpt the following figure. A set of rules guides the group discussion to determine the existence of a relationship and then the nature of that relationship. The group also 'weights' each relationship as to impact strength (low-green, moderate-blue, high-red).

Policy Screening	**informs**	Leading & Coordinating
Policy Screening	**tests**	Public Consulting
Policy Screening	**xx**	Policy Screening
Policy Screening	**informs**	Final Decision-Making
Policy Screening	**underpins**	Researching & Analyzing

Policy Screening	provides content for	Lobbying & Influencing
Policy Screening		Issue Prioritization
Policy Screening		Framing & Commun.
Public Consulting	strengthens/informs	Leading & Coordinating
Public Consulting	xx	Public Consulting
Public Consulting		Policy Screening
Public Consulting	shapes	Final Decision-Making
Public Consulting	calibrates	Researching & Analyzing
Public Consulting		Lobbying & Influencing
Public Consulting	strengthens	Issue Prioritization
Public Consulting	limits	Framing & Commun.
……		

Figure 5. Partial spreadsheet of Policy Setting Relationships.

The spreadsheet results are converted into a visual map image (see Figure 6 below). The circles represent the elements and the lines represent the relationships. In this figure only the high impact relationships are displayed to illustrate. The relationship between two elements is read at the tip of the arrow. For example, 'Exercising Internal Power (upper right) determines Leading/Coordinating Processes (upper left)'. The first number in the circle represents the number of relationships impacting other elements; the second number the number of elements impacting this element; the third number, the number of mutual impacting relationships. This array of numbers can be used to explore and critique the role of any element in the subsystem.

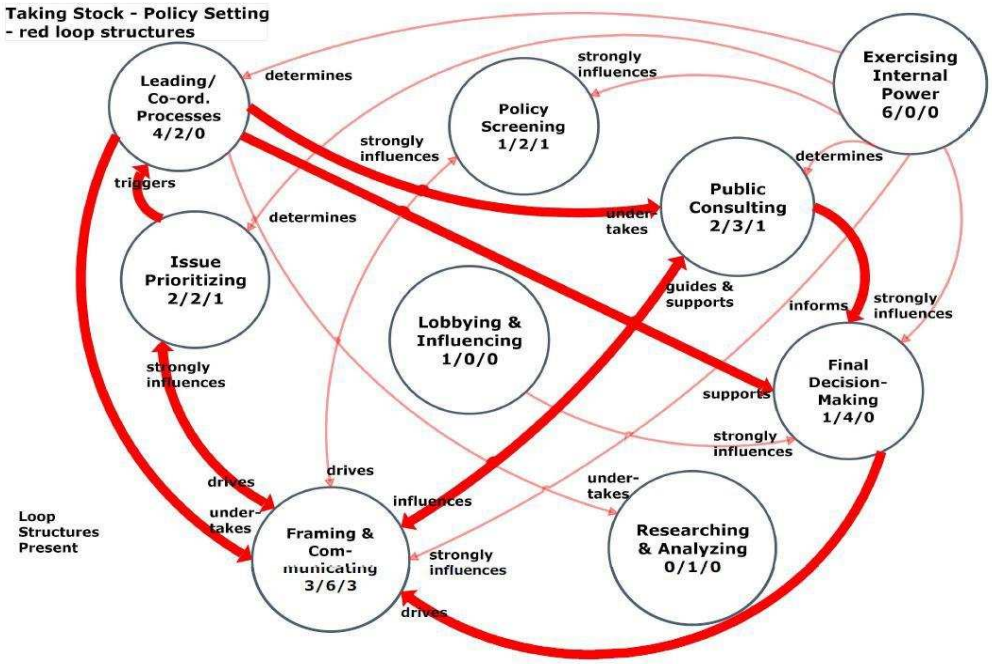

Figure 6. Systems Map of Policy Setting Sub-System.

A map allows a number of analyses but not all relationships are included in each analysis. Some lines are left out because they do not add anything new to the analysis. The following adjustment was made to the Policy Setting map from above by identifying "loop structures." Loops are important because they reveal the central self-perpetuating dynamics of a system – how the system operates and functions. Identifying the loop structures helps to explain why a systems operates the way it does. In this example four elements are not contained in any loops. Meaning can be drawn from what is included in the loops and from what is left out. (see Taking Stock Report (Alberta Ecotrust, 2014) for a complete description of loops).

Critique of the Systems Mapping Component

The systems mapping process demonstrated a number of positive outcomes and impacts:

- Provides a coordinated and shared representation of a current system of dynamic processes;
- Groups of experts use their knowledge and their own language and share a great deal of tacit information not usually or normally shared;
- The shared 'narrative' affirms what is generally known, explains current outcomes/patterns and identifies points of potential intervention;
- Provides a shared basis for identifying and debating different 'renovation' possibilities; and
- Generates alternative interpretations as basis for debate and ultimately a palette of design ideas.

On the other hand, there are some costs to gaining the insights from the mapping work:

- Lengthy process (1.5 days) consuming considerable participant energy;
- Can be affected by participants not showing up for all sessions;
- Requires facilitation leadership to manage process while ensuring participant ownership;
- Mapping process easy to grasp but 'reading' the maps takes time, energy and facilitation; and
- Maps have greatest meaning for the group that develops them but less for meaning for those who did not (more work to interpret).

Re-Design Component

This stage of the project brought the two previous components together and allowed participants to identify, debate and discuss potential improvements to the current system of environmental decision making. The challenges that were generated from the future scenarios component acted as both the motivation for changing the current system as well as the primary basis for the design criteria themselves. In other words, the future challenges indicated what requirements the overall system needed to display to be effective in the future and so became the criteria around which system changes were considered. Participants adopted the term "renovations" to talk about these changes. The idea is to think about the changes in the same way homeowners might consider renovations to their home. Based on future requirements such as the arrival of a new child or the need to provide long-term care for a parent, a homeowner may be prompted to consider new bedrooms, larger family areas, etc. The extent and type of renovations are based on future needs. The planning constraint is that the renovations need to be done to the current house in the sense that one begins with what one has.

There were two approaches to renovation – a sub-system approach and a full system approach. The first focused just on a single sub-system to help introduce participants to the thinking and the mechanics of re- design. The second approach took an overall, whole system lens and focused on generating a variety of designs. The objective of this component was to generate a number of possible renovation designs or 'strategic intentions'.

Sub-System Renovations

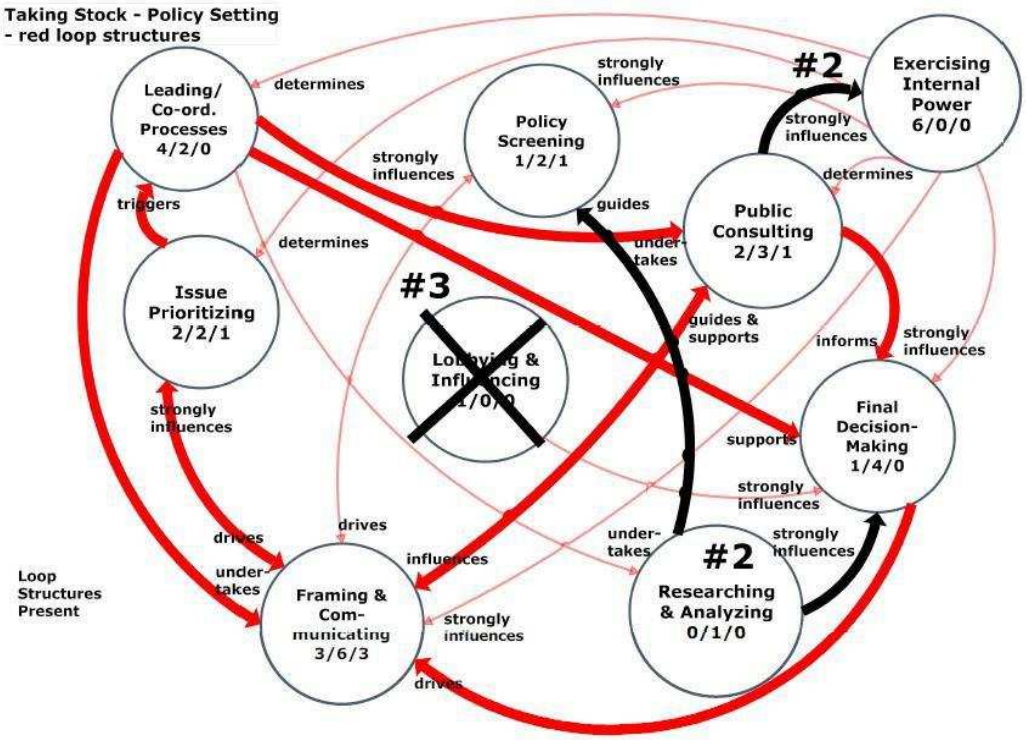

Figure 7. Systems Map of Renovations to the Policy Setting Sub-System.

Using the same example from the last section of the Policy Setting sub-system participants identified three major renovations that they thought would improve the current system to meet the following criteria:

- Build government capacity to enhance collaboration and consultation processes;
- Build flexibility to enhance ability to adapt;
- Support public engagement; and
- Support collaboration at all levels.

Using the sub-system map from the above section, participants identified three major renovations (strategic intentions) to the loop structures. The first was to strengthen the influence of the researching and analyzing component at the formal level. As can be seen from the figure above, this renovation could be realized by creating two new 'strong' relationships:

- Researching and Analyzing guides Policy Screening; and
- Researching and Analyzing strongly influences Final Decision-Making.

The second renovation focused on connecting the public consultation process to the internal power of the policy making bureaucracy. This renovation could be realized by adding the relationship:

- Public Consulting strongly influences Exercising Internal Power.

The final renovation idea focused on eliminating the external and internal lobbying and influencing that shows up at the 'moderate level' (not shown) but has a very strong influence on the final decision-making

at the 'strong level'. By eliminating this element (this set of activities or processes), participants felt that the sub-system, as currently structured, could meet the design requirements.

Whole System Renovations

Using all four of the sub-systems collectively participants identified a set of major whole-system renovations that they thought would improve the current system to meet the following additional criteria (added to those four above):

- Foster a mindset and motivation to address issues from a systems perspective with collaboration and respect; and
- Clarify the role of government.

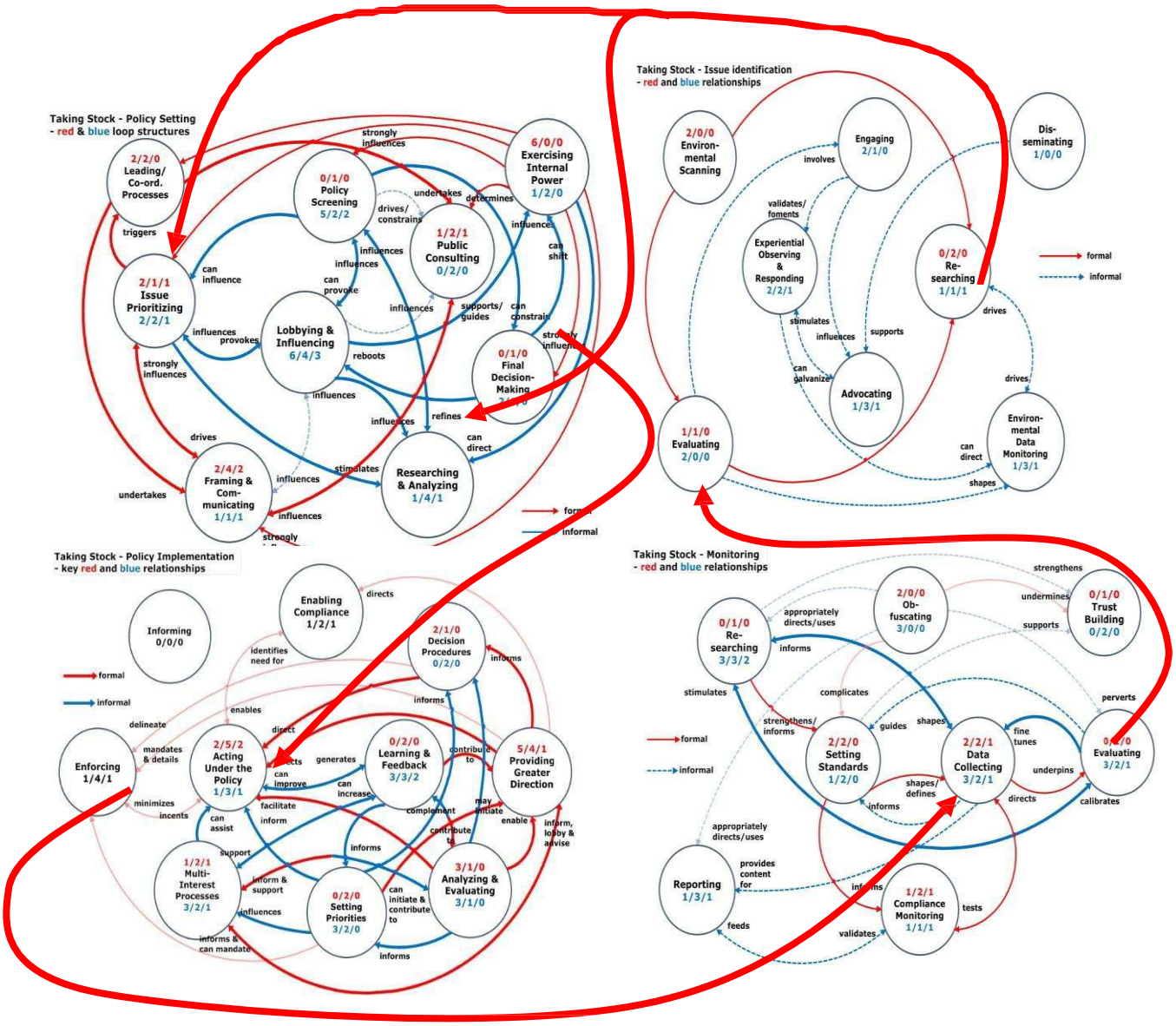

Figure 8. Systems Map of Renovation to entire EPD&DM System.

The above figure shows the four sub-systems with the Policy Setting sub-system in the upper left. The major renovations suggested by participants are demonstrated by creating a set of new relationships. This set of new relationships creates a loop structure that links key policy setting elements to research and data collection elements across all sub-systems.

Starting from the Researching element in the upper right sub-system, two new 'strong' relationships are suggested: one to Issue Prioritizing and a second to Researching and Analyzing (in the upper left sub- system). The Final Decision-Making element of this sub-system is then linked strongly to Acting Under the Policy (lower left) and then another strong new relationship to Data Collecting in the lower right sub-system. Within this sub-system (Monitoring) there is a strong link already existing to Evaluating. Participants suggesting a strong link be made between this element (Evaluating) and the Evaluating element in the upper right sub-system (Issue Identification). With this link comes access to a strong loop structure already existing in the upper right sub-system that connects Evaluating to Researching. With these additions a new, strong, whole-system loop is created within the overall system.

A number of alternative renovations were generated by other design teams but they are not contained here (Alberta Ecotrust, 2014).

Critique of the Re-Design Component

Using the systems maps with the scenario results design criteria were generated that provided a number of advantages to the design activity:

- Easy to envision intervention points in the current system;
- Futures work provides broader design criteria than solely a focus on meeting present needs;
- Ability to 'trace through' and identify potential unanticipated consequences of any renovation idea or proposal;
- Can see the different renovation approaches depending on background and interested of groups proposing renovation ideas;
- Provides a way to compare and contrast renovation ideas; and
- Connected future challenges to system re-design.

As well, there are costs to getting the generated results from this approach:

- Requires facilitation leadership to manage process;
- Requires time for participants to get acquainted with maps and challenges;
- No 'space' for designing a completely 'new' system;
- Some renovation ideas 'not possible' (e.g. changing processes that are legally bound); and
- Some 'powerful' changes not seen as such initially.

Critique of Overall Project Approach

The project was undertaken to provide a considered and thoughtful set of strategic changes to a current system of environmental policy development and decision-making that had many problems. The project engaged those who cared about and who were involved in and affected by the current system creating a sound multi-stakeholder approach to design. The project engaged knowledgeable participants, using their own language to imagine, discuss and decide. The value of combining scenarios and systems mapping was evident both as a means of engagement, of generating and representing knowledge and of using representations as a design medium. Valuable insights into the current system for environmental policy development and decision-making were forthcoming.

On the other hand, there was a cost paid for the valuable insights. The project required a number of intense sessions that demanded a high degree of energy from participants. The project stretched over multiple sessions so it was sometimes difficult to get consistent participation due to work demands and other commitments of our knowledgeable group. As organizers, we would have liked more time, especially in the re-design phase. So many good ideas emerged but there was insufficient time to explore them all. Finally no follow-up procedures were put in place to capture the effects of participation or effects of the project itself on system change itself.

The project did show that significant insights leading to new designs can be generated by a set of committed, knowledgeable stakeholders who have a passion for change.

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